

Notice for TAIYO YUDEN Products

Please read this notice before using the TAIYO YUDEN products.

REMINDERS

Product Information in this Catalog

Product information in this catalog is as of October 2021. All of the contents specified herein and production status of the products listed in this catalog are subject to change without notice due to technical improvement of our products, etc. Therefore, please check for the latest information carefully before practical application or use of our products.

Please note that TAIYO YUDEN shall not be in any way responsible for any damages and defects in products or equipment incorporating our products, which are caused under the conditions other than those specified in this catalog or individual product specification sheets.

Approval of Product Specifications

Please contact TAIYO YUDEN for further details of product specifications as the individual product specification sheets are available. When using our products, please be sure to approve our product specifications or make a written agreement on the product specification with TAIYO YUDEN in advance.

Pre-Evaluation in the Actual Equipment and Conditions

Please conduct validation and verification of our products in actual conditions of mounting and operating environment before using our products.

Safety Design

When using our products for high safety and/or reliability-required equipment or circuits, please fully perform safety and/or reliability evaluation. In addition, please install (i) systems equipped with a protection circuit and a protection device and/or (ii) systems equipped with a redundant circuit or other system to prevent an unsafe status in the event of a single fault for a failsafe design to ensure safety.

Intellectual Property Rights

Information contained in this catalog is intended to convey examples of typical performances and/or applications of our products and is not intended to make any warranty with respect to the intellectual property rights or any other related rights of TAIYO YUDEN or any third parties nor grant any license under such rights.

Limited Warranty

Please note that the scope of warranty for our products is limited to the delivered our products themselves conforming to the product specifications specified in the individual product specification sheets, and TAIYO YUDEN shall not be in any way responsible for any damages resulting from a failure or defect in our products. Notwithstanding the foregoing, if there is a written agreement (e.g., supply and purchase agreement, quality assurance agreement) signed by TAIYO YUDEN and your company, TAIYO YUDEN will warrant our products in accordance with such agreement, provided, however, that our products shall be used for general-purpose and standard use in the equipment specified in this catalog or the individual product specification sheets.

TAIYO YUDEN's Official Sales Channel

The contents of this catalog are applicable to our products which are purchased from our sales offices or authorized distributors (hereinafter "TAIYO YUDEN's official sales channel"). Please note that the contents of this catalog are not applicable to our products purchased from any seller other than TAIYO YUDEN's official sales channel.

Caution for Export

Some of our products listed in this catalog may require specific procedures for export according to "U.S. Export Administration Regulations", "Foreign Exchange and Foreign Trade Control Law" of Japan, and other applicable regulations. Should you have any questions on this matter, please contact our sales staff.

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Limited Application

1. Equipment Intended for Use

The products listed in this catalog are intended for general-purpose and standard use in general electronic equipment for consumer (e.g., AV equipment, OA equipment, home electric appliances, office equipment, information and communication equipment including, without limitation, mobile phone, and PC) and other equipment specified in this catalog or the individual product specification sheets, or the equipment approved separately by TAIYO YUDEN. TAIYO YUDEN has the product series intended for use in the following equipment. Therefore, when using our products for these equipment, please check available applications specified in this catalog or the individual product specification sheets and use the corresponding products.

Application	Product Series		Quality Grade ³⁾
	Equipment ¹⁾	Category (Part Number Code ²⁾)	
Automotive	Automotive Electronic Equipment (POWERTRAIN, SAFETY)	A	1
	Automotive Electronic Equipment (BODY & CHASSIS, INFOTAINMENT)	C	2
Industrial	Telecommunications Infrastructure and Industrial Equipment	B	2
Medical	Medical Devices classified as GHTF Class C (Japan Class III)	M	2
	Medical Devices classified as GHTF Classes A or B (Japan Classes I or II)	L	3
Consumer	General Electronic Equipment	S	3

*Notes: 1. Based on the general specifications required for electronic components for such equipment, which are recognized by TAIYO YUDEN, the use of each product series for the equipment is recommended. Please be sure to contact TAIYO YUDEN before using our products for equipment other than those covered by the product series.

2. On each of our part number, the 2nd code from the left is a code indicating the "Category" as shown in the above table. For details, please check the explanatory materials regarding the part numbering system of each of our products.

3. Each product series is assigned a "Quality Grade" from 1 to 3 in order of higher quality. Please do not incorporate a product into any equipment with a higher Quality Grade than the Quality Grade of such product without the prior written consent of TAIYO YUDEN.

2. Equipment Requiring Inquiry

Please be sure to contact TAIYO YUDEN for further information before using the products listed in this catalog for the following equipment (excluding intended equipment as specified in this catalog or the individual product specification sheets) which may cause loss of human life, bodily injury, serious property damage and/or serious public impact due to a failure or defect of the products and/or malfunction attributed thereto.

- (1) Transportation equipment (automotive powertrain control system, train control system, and ship control system, etc.)
- (2) Traffic signal equipment
- (3) Disaster prevention equipment, crime prevention equipment
- (4) Medical devices classified as GHTF Class C (Japan Class III)
- (5) Highly public information network equipment, data-processing equipment (telephone exchange, and base station, etc.)
- (6) Any other equipment requiring high levels of quality and/or reliability equal to the equipment listed above

3. Equipment Prohibited for Use

Please do not incorporate our products into the following equipment requiring extremely high levels of safety and/or reliability.

- (1) Aerospace equipment (artificial satellite, rocket, etc.)
- (2) Aviation equipment ¹⁾
- (3) Medical devices classified as GHTF Class D (Japan Class IV), implantable medical devices ²⁾
- (4) Power generation control equipment (nuclear power, hydroelectric power, thermal power plant control system, etc.)
- (5) Undersea equipment (submarine repeating equipment, etc.)
- (6) Military equipment
- (7) Any other equipment requiring extremely high levels of safety and/or reliability equal to the equipment listed above

*Notes: 1. There is a possibility that our products can be used only for aviation equipment that does not directly affect the safe operation of aircraft (e.g., in-flight entertainment, cabin light, electric seat, cooking equipment) if such use meets requirements specified separately by TAIYO YUDEN. Please be sure to contact TAIYO YUDEN for further information before using our products for such aviation equipment.

2. Implantable medical devices contain not only internal unit which is implanted in a body, but also external unit which is connected to the internal unit.

4. Limitation of Liability

Please note that unless you obtain prior written consent of TAIYO YUDEN, TAIYO YUDEN shall not be in any way responsible for any damages incurred by you or third parties arising from use of the products listed in this catalog for any equipment that is not intended for use by TAIYO YUDEN, or any equipment requiring inquiry to TAIYO YUDEN or prohibited for use by TAIYO YUDEN as described above.

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Medical Application Guide

According to the medical devices classified as GHTF Classes A to C (Japan Classes I to III), we have the corresponding product series (the part number code of 2nd digit from the left side is "M" or "L") intended for use in the medical devices. Therefore, when using our products for the medical devices, please be sure to check the classification based on the GHTF Rules and use the corresponding product series.

On the other hand, we don't have the product series intended for use in (i) all medical devices classified as GHTF Class D (Japan Class IV) and (ii) implantable medical devices (bone-anchored hearing aid, artificial retina system, and external unit which is connected to internal unit which is implanted in a body, etc.). Therefore, please do not incorporate our products into these medical devices. Should you have any questions on this matter, please contact us.

Risk Level		Low → High			
Japan	Classification according to the PMP Act of Japan (based on the GHTF Rules)	Class I General Medical Devices (GHTF Class A)	Class II Controlled Medical Devices (GHTF Class B)	Class III Specially-controlled Medical Devices (GHTF Class C)	Class IV Specially-controlled Medical Devices (GHTF Class D)
		Medical devices with extremely low risk to the human body in case of problems [Ex.] • In Vitro Diagnostic Devices • Nebulizer • Blood Gas Analyzer • Plethysmograph • Breathing Sensor • AC-powered Operating Table • Surgical Light • Cholesterol Analysis Device • Blood Type Analysis Device, etc.	Medical devices with relatively low risk to the human body in case of problems [Ex.] • Electronic Thermometer • Electronic Blood Pressure Gauge • Electronic Endoscope • Hearing Aid • Electrocardiograph • MRI • Ultrasonic Diagnostic System • Diagnostic Imaging Equipment • X-ray Diagnostic Equipment • Central Monitor • Pulse Oximeter, etc.	Medical devices with relatively high risk to the human body in case of problems [Ex.] • Dialysis Machine • Radiation Therapy Equipment • Infusion Pump • Respirator • Glucose Monitoring System • AED (Automated External Defibrillator) • Skin Laser Scanner • Electric Surgical Unit • Insulin Pump, etc.	Medical devices highly invasive to patients and with life-threatening risk in case of problems [Ex.] • Cardiac Pacemaker • Video Flexible Angioscope • Implantable Infusion Pump • Cardiac Electrosurgical Unit • Inspection Device with Cardiac Catheter • Defibrillator, etc.
U.S.A.	FDA Classification	Class I General Controls	Class II General Controls and Special Controls	Class III General Controls and Premarket Approval	
		Medical devices without the possibility of causing serious injury or harm to the patient or user even if there is a defect or malfunction in such medical devices	Medical devices with the possibility of causing injury or harm to the patient or user if there is a defect or malfunction in such medical devices	Medical devices with the possibility of causing serious injury, disability or death to the patient or user if a defect or malfunction occurs in such medical devices	
Corresponding TAIYO YUDEN Product Series		Product Series for Medical Devices classified as GHTF Classes A or B (Japan Classes I or II) (Part Number Code of 2nd Digit from the Left Side: "L")		Product Series for Medical Devices classified as GHTF Class C (Japan Class III) (Part Number Code of 2nd Digit from the Left Side: "M") (See the Note below.)	
				N/A	

* Note: It is prohibited that our products are used in some medical devices such as implantable medical devices even if such medical

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for Medical Devices Equipment

Multilayer Metal Power Inductors MCOIL™ LLCN series for Medical Devices classified as GHTF Classes A or B (Japan Classes I or II)

Code in front of Series have been extracted from Part number, which describes the segment of products, such as kind and characteristics.

PART NUMBER
Operating Temp.: -40~+125°C (including self-generated heat)

L	L	C	N	A	2	0	1	2	H	K	T	1	R	0	M			
①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮	⑯	⑰	⑱	

① Series

Code	
(1)(2)(3)(4)	
LLCN	Multilayer metal power inductor for Medical Devices classified as GHTF Classes A or B (Japan Classes I or II)

(1) Product Group

Code	
L	Inductors

(2) Category

Code	Recommended equipment	Quality Grade
L	Medical Devices classified as GHTF Classes A or B (Japan Classes I or II)	3

③ Type

Code	
C	Metal Multilayer

(4) Features, Characteristics

Code	
N	Standard Power choke

⑤ Packaging

Code	Packaging
T	Taping

(6) Nominal inductance

Code (example)	Nominal inductance [μH]
R24	0.24
R47	0.47
R90	0.90

⑦ Inductance tolerance

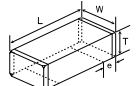
Code	Inductance tolerance
M	±20%

⑧ Internal code

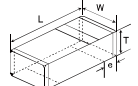
Code	Thickness [mm]
EK	0.50 max
EE	0.55 max
FK	0.60 max
FE	0.65 max
HK	0.80 max
KK	1.2 max

STANDARD EXTERNAL DIMENSIONS / STANDARD QUANTITY

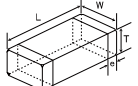
L-shape electrode



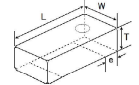
L-shape electrode with polarity marking



S-surface electrode



Bottom electrode with polarity marking



Type	L	W	T	e	Standard quantity [pcs]	
					Paper tape	Embossed tape
1005EE (0402)	1.0±0.2 (0.039±0.008)	0.5±0.2 (0.020±0.008)	0.55 max (0.022 max)	0.25±0.15 (0.010±0.006)	10000	—
1210EK (0504)	1.25±0.1 (0.049±0.004)	1.05±0.1 (0.041±0.004)	0.50 max (0.020 max)	0.30±0.2 (0.012±0.008)	5000	—
1412FE (0505)	1.4±0.2 (0.055±0.009)	1.2±0.2 (0.041±0.009)	0.65 max (0.026 max)	0.50±0.2 (0.02±0.008)	4000	—
1608FK (0603)	1.6±0.2 (0.063±0.008)	0.8±0.2 (0.031±0.008)	0.60 max (0.024 max)	0.3±0.2 (0.012±0.008)	4000	—
1608FE (0603)	1.6±0.2 (0.063±0.008)	0.8±0.2 (0.031±0.008)	0.65 max (0.026 max)	0.3±0.2 (0.012±0.008)	4000	—
1608HK (0603)	1.6±0.2 (0.063±0.008)	0.7±0.2 (0.031±0.008)	0.50 max (0.031 max)	0.4±0.2 (0.016±0.008)	4000	—
1608KK (0603)	1.6±0.2 (0.063±0.008)	0.8±0.2 (0.031±0.008)	1.0 max (0.039 max)	0.3±0.2 (0.012±0.008)	—	3000
2012HK (0805)	2.0±0.2 (0.079±0.009)	1.25±0.2 (0.049±0.009)	0.80 max (0.031 max)	0.5±0.3 (0.02±0.012)	4000	—
2012KK (0805)	2.0±0.2 (0.079±0.009)	1.25±0.2 (0.049±0.009)	1.0 max (0.039 max)	0.5±0.3 (0.02±0.012)	—	3000
2018FE (0806)	2.0±0.2 (0.079±0.009)	1.6±0.2 (0.063±0.009)	0.65 max (0.026 max)	0.5±0.3 (0.02±0.012)	4000	—

Unit: mm(mph)

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For details of each product characteristics graph, reliability information, precautions for use, and so on, see our Web site (<http://www.ty-yuden.com/>).

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LInfo_LMC_L_e-E10R01

for Medical Devices Equipment

PART NUMBER

①1005 type									
New part number	Old part number (for reference)	EHS	Nominal inductance [μH]	Inductance tolerance	DC Resistance [mΩ]	Rated current1a) [A](max.)	Rated current3a) [A](max.)	Measuring frequency [MHz]	Thickness [mm](max.)
LLCND1005EE1TR10MB	NICEE1005TR10MBN	RuHS	0.10	±20%	35	41	2.0	1.8	0.55
LLCND1005EE1TR22MB	NICEE1005TR22MBN	RuHS	0.22	±20%	80	85	1.8	1.8	0.55
LLCND1005EE1TR47MB	NICEE1005TR47MBN	RuHS	0.47	±20%	140	114	1.2	1.2	0.55
LLCND1005EE1TR10MB	NICEE1005TR10MBN	RuHS	1.0	±20%	300	244	1.0	0.8	0.55
①1210 type									
New part number	Old part number (for reference)	EHS	Nominal inductance [μH]	Inductance tolerance	DC Resistance [mΩ]	Rated current1a) [A](max.)	Rated current3a) [A](max.)	Measuring frequency [MHz]	Thickness [mm](max.)
LLCND1210EK1TR10MB	NICEE1210TR10MBN	RuHS	0.47	±20%	65	70	2.3	1.8	0.59
LLCND1210EK1TR22MB	NICEE1210TR22MBN	RuHS	1.0	±20%	178	132	1.8	1.1	0.59
LLCND1210EK1TR47MB	NICEE1210TR47MBN	RuHS	1.5	±20%	240	200	1.2	0.9	0.59
①1412 type									
New part number	Old part number (for reference)	EHS	Nominal inductance [μH]	Inductance tolerance	DC Resistance [mΩ]	Rated current1a) [A](max.)	Rated current3a) [A](max.)	Measuring frequency [MHz]	Thickness [mm](max.)
LLCND1412FE1TR10MB	NICEE1412TR10MBN	RuHS	0.33	±20%	32	35	3.0	3.1	0.65
LLCND1412FE1TR22MB	NICEE1412TR22MBN	RuHS	0.47	±20%	42	39	3.0	3.1	0.65
①1608 type									
New part number	Old part number (for reference)	EHS	Nominal inductance [μH]	Inductance tolerance	DC Resistance [mΩ]	Rated current1a) [A](max.)	Rated current3a) [A](max.)	Measuring frequency [MHz]	Thickness [mm](max.)
LLCND1608FK1TR10MB	NICEE1608TR10MBN	RuHS	0.24	±20%	59	65	2.3	2.1	0.69
LLCND1608FK1TR22MB	NICEE1608TR22MBN	RuHS	0.47	±20%	85	89	1.9	1.8	0.69
LLCND1608FK1TR47MB	NICEE1608TR47MBN	RuHS	1.0	±20%	224	182	1.5	0.8	0.69
LLCND1608FK1TR10MB	NICEE1608TR10MBN	RuHS	0.24	±20%	100	70	2.8	1.5	0.65
LLCND1608FK1TR22MB	NICEE1608TR22MBN	RuHS	0.47	±20%	152	114	2.0	1.2	0.65
LLCND1608FK1TR47MB	NICEE1608TR47MBN	RuHS	1.0	±20%	240	210	1.4	0.8	0.65
LLCND1608HK1TR10MB	NICEE1608TR10MBN	RuHS	0.34	±20%	24	20	4.3	3.7	0.60
LLCND1608HK1TR22MB	NICEE1608TR22MBN	RuHS	0.47	±20%	43	38	3.3	3.7	0.60
LLCND1608HK1TR47MB	NICEE1608TR47MBN	RuHS	0.58	±20%	55	45	2.7	2.8	0.60
LLCND1608HK1TR10MB	NICEE1608TR10MBN	RuHS	0.34	±20%	112	80	2.8	1.6	0.60
LLCND1608HK1TR22MB	NICEE1608TR22MBN	RuHS	0.47	±20%	200	180	1.7	1.3	0.60
LLCND1608HK1TR47MB	NICEE1608TR47MBN	RuHS	0.58	±20%	232	212	1.5	1.2	0.60
LLCND1608KK1TR10MB	NICEE1608TR10MBN	RuHS	0.47	±20%	38	35	2.8	2.8	1.00
LLCND1608KK1TR22MB	NICEE1608TR22MBN	RuHS	0.67	±20%	55	48	2.4	2.0	1.00
LLCND1608KK1TR47MB	NICEE1608TR47MBN	RuHS	1.0	±20%	123	100	2.0	1.8	1.00
①2012 type									
New part number	Old part number (for reference)	EHS	Nominal inductance [μH]	Inductance tolerance	DC Resistance [mΩ]	Rated current1a) [A](max.)	Rated current3a) [A](max.)	Measuring frequency [MHz]	Thickness [mm](max.)
LLCND2012HK1TR10MB	NICEE2012TR10MBN	RuHS	0.24	±20%	24	19	4.32	3.60	0.69
LLCND2012HK1TR22MB	NICEE2012TR22MBN	RuHS	0.47	±20%	36	29	3.21	3.15	0.69
LLCND2012HK1TR47MB	NICEE2012TR47MBN	RuHS	1.0	±20%	111	90	2.25	1.47	0.69
LLCND2012KK1TR10MB	NICEE2012TR10MBN	RuHS	0.24	±20%	25	20	4.3	4.0	1.00
LLCND2012KK1TR22MB	NICEE2012TR22MBN	RuHS	0.47	±20%	39	30	3.5	3.1	1.00
LLCND2012KK1TR47MB	NICEE2012TR47MBN	RuHS	1.0	±20%	80	73	3.0	2.1	1.00
LLCND2012KK1TR10MB	NICEE2012TR10MBN	RuHS	0.11	±20%	12	11	6.0	5.6	0.69
LLCND2012KK1TR22MB	NICEE2012TR22MBN	RuHS	0.24	±20%	17	14	6.0	4.8	0.69
LLCND2012KK1TR47MB	NICEE2012TR47MBN	RuHS	0.47	±20%	26	20	4.8	4.0	0.69
LLCND2012KK1TR10MB	NICEE2012TR10MBN	RuHS	0.47	±20%	26	20	4.8	4.0	0.69
①2018 type									
New part number	Old part number (for reference)	EHS	Nominal inductance [μH]	Inductance tolerance	DC Resistance [mΩ]	Rated current1a) [A](max.)	Rated current3a) [A](max.)	Measuring frequency [MHz]	Thickness [mm](max.)
LLCND2018FE1TR10MB	NICEE2018TR10MBN	RuHS	0.47	±20%	40	40	4.0	3.2	0.65
LLCND2018FE1TR22MB	NICEE2018TR22MBN	RuHS	0.67	±20%	60	50	3.0	2.5	0.65
LLCND2018FE1TR47MB	NICEE2018TR47MBN	RuHS	1.0	±20%	70	60	2.8	2.3	0.65

①1a) is the DC value at which the initial L value is decreased within 30% by the application of DC bias. (at 20°C)
①3a) is the DC value at which the temperature of element is increased within 40°C by the application of DC bias. (at 20°C)

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TAIYO YUDEN

LInfo_LMC_L_e-E10R01

Multilayer Metal Power Inductors MCOIL™ LSCN/LCCN/LBCN/LCN/LMCN series

PACKAGING

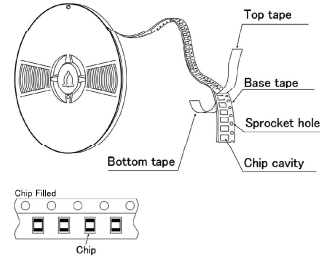
① Minimum Quantity

Tape & Reel Packaging

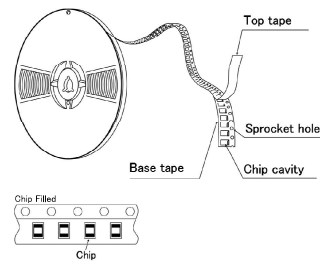
Type	Code	Thickness		Standard Quantity [pcs]	
		mm (inch)		Paper Tape	Embossed Tape
1005 (0402)	EE	0,55 max (0,022 max)		10000	—
1210 (0504)	EK	0,5 max (0,020 max)		5000	—
1412 (0505)	FE	0,65 max (0,026 max)		4000	—
1608 (0603)	FK	0,6 max (0,024 max)		4000	—
1608 (0603)	FE	0,65 max (0,026 max)		4000	—
1608 (0603)	HK	0,8 max (0,031 max)		4000	—
1608 (0603)	KK	1,0 max (0,039 max)		—	3000
2012 (0805)	HK	0,8 max (0,031 max)		4000	—
2012 (0805)	KK	1,0 max (0,039 max)		—	3000
2016 (0806)	FE	0,65 max (0,026 max)		4000	—

② Taping material

Card board carrier tape 1005/1210/1412/1608/2012/2016 type



Embossed Tape 1608/2012 type



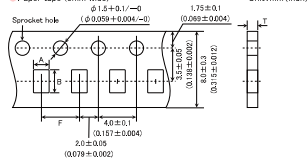
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TAIYO YUDEN

LMLMCNseriesE1000

③ Taping Dimensions

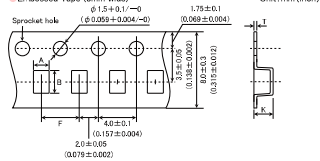
Paper tape (8mm wide)



Type	Code	Thickness mm (inch)	Chip cavity		Insertion Pitch	Tape Thickness	
			A	B	F	K	T
1005 (0402)	EE	0,55 max (0,021 max)	0,8 (0,031)	1,3 (0,051)	2,0±0,05 (0,079±0,002)	0,44 max (0,025 max)	0,44 max (0,025 max)
1210 (0504)	EK	0,5 max (0,020 max)	1,3 (0,051)	1,55 (0,061)	4,0±0,1 (0,157±0,004)	0,44 max (0,025 max)	0,44 max (0,025 max)
1412 (0505)	FE	0,65 max (0,026 max)	1,6 (0,063)	1,6 (0,071)	4,0±0,1 (0,157±0,004)	0,72 max (0,028 max)	0,72 max (0,028 max)
1608 (0603)	FK	0,6 max (0,024 max)	1,1 (0,043)	1,9 (0,075)	4,0±0,1 (0,157±0,004)	0,72 max (0,028 max)	0,72 max (0,028 max)
1608 (0603)	FE	0,65 max (0,026 max)	1,1 (0,043)	1,9 (0,075)	4,0±0,1 (0,157±0,004)	0,72 max (0,028 max)	0,72 max (0,028 max)
1608 (0603)	HK	0,8 max (0,031 max)	1,2 (0,047)	2,0 (0,079)	4,0±0,1 (0,157±0,004)	0,8 max (0,031 max)	0,8 max (0,031 max)
2012 (0805)	HK	0,8 max (0,031 max)	1,65 (0,065)	2,4 (0,094)	4,0±0,1 (0,157±0,004)	0,8 max (0,031 max)	0,8 max (0,031 max)
2016 (0806)	FE	0,65 max (0,026 max)	1,95 (0,077)	2,3 (0,091)	4,0±0,1 (0,157±0,004)	0,72 max (0,028 max)	0,72 max (0,028 max)

Unit: mm (inch)

Embossed Tape (8mm wide)



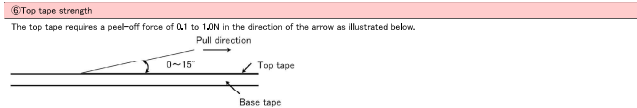
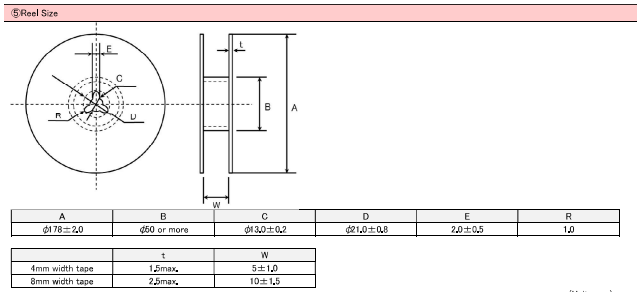
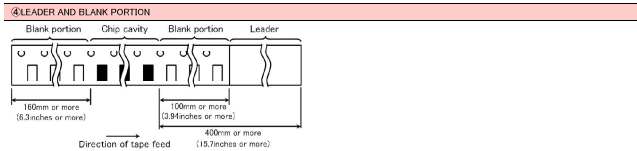
Type	Code	Thickness mm (inch)	Chip cavity		Insertion Pitch	Tape Thickness	
			A	B	F	K	T
1608 (0603)	KK	1,0 max (0,039 max)	1,1 (0,043)	1,95 (0,077)	4,0±0,1 (0,157±0,004)	1,5 max (0,059 max)	0,3 max (0,012 max)
2012 (0805)	KK	1,0 max (0,039 max)	1,55 (0,061)	2,35 (0,093)	4,0±0,1 (0,157±0,004)	1,45 max (0,057 max)	0,3 max (0,012 max)

Unit: mm (inch)

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LMLMCNseriesE1000



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UnifMLCseries-E10001

Multilayer Metal Power Inductors MCOIL™ LSCN series
for General Electronic Equipment for Consumer
Multilayer Metal Power Inductors MCOIL™ LLCN series
for Medical Devices classified as GHTF Classes A or B (Japan Classes I or II)

RELIABILITY DATA	
1. Operating Temperature Range	
Specified Value	−40~+125°C (Including self-generated heat)
2. Storage Temperature Range	
Specified Value	−40~+85°C
3. Rated Current	
Specified Value	Iel1: The decreasing rate of inductance value is within 30 % Iel2: The temperature of the element is increased within 40°C
4. Impedance	
Specified Value	—
5. Inductance	
Specified Value	Refer to each specification.
Test Methods and Remarks	Measuring frequency : 1MHz Measuring equipment : E4991 (or its equivalent)
6. Q	
Specified Value	—
7. DC Resistance	
Specified Value	Refer to each specification.
Test Methods and Remarks	Measuring equipment: HEOK RM3545 (or its equivalent)
8. Self Resonance Frequency (SRF)	
Specified Value	—
9. Resistance to Flexure of Substrate	
Specified Value	No mechanical damage.
Test Methods and Remarks	Warp : 2mm Testing board : glass epoxy-resin substrate Thickness : 0.8mm
10. Solderability	
Specified Value	At least 80% of terminal electrode is covered by new solder.
Test Methods and Remarks	Solder temperature : 245±3°C (Sn/30Ag/0.5Cu) Duration : 4±1 sec.

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UnifMLCseries-E10001

(Note 1) Measurement shall be made after 48 ± 2 hrs of recovery under the standard condition.
 "standard condition" referred to herein is defined as follows:
 5 to 35°C of temperature, 25 to 85% relative humidity.
 When there are questions concerning measurement results:
 In order to provide correlation data, the test shall be conducted under condition of 20 ± 2°C of temperature, 60 to 70% relative humidity, and 86 to 106 kPa of air pressure. Unless otherwise specified, all the tests are conducted under the "standard condition."

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■ PRECAUTIONS

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◆Pattern configurations(Inductor layout on panelized[breakaway] PC boards)

1. The following are examples of good and bad inductor layout. SMD inductors should be located to minimize any possible mechanical stresses from board warp or deflection.

Item	Not recommended	Recommended
Deflection of the board		 Position the component at a right angle to the direction of the mechanical stresses that are anticipated.

2. To layout the inductors for the breakaway PC board, it should be noted that the amount of mechanical stresses given will vary depending on inductor layout.
An example below should be counted for better design.

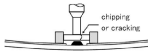

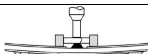
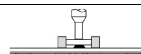
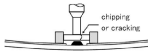

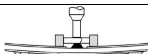
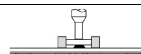
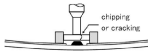

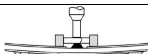
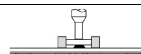
3. When breaking PC boards along their perforations, the amount of mechanical stress on the inductors can vary according to the method used. The following methods are listed in order from least stressful to most stressful: push-back, slit, V-grooving, and perforation. Thus, any ideal SMD inductor layout must also consider the PCB splitting procedure.

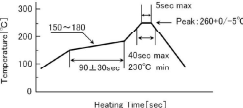
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3. Considerations for automatic placement

Precautions	<p>◆Adjustment of mounting machine</p> <ol style="list-style-type: none"> Excessive impact load should not be imposed on the inductors when mounting onto the PC boards, The maintenance and inspection of the mounter should be conducted periodically. <p>◆Adjustment of mounting machine</p> <ol style="list-style-type: none"> If the lower limit of the pick-up nozzle is low, too much force may be imposed on the inductors, causing damage. To avoid this, the following points should be considered before lowering the pick-up nozzle: <ol style="list-style-type: none"> The lower limit of the pick-up nozzle should be adjusted to the surface level of the PC board after correcting for deflection of the board, The pick-up pressure should be adjusted between 1 and 3N static loads, To reduce the amount of deflection of the board caused by impact of the pick-up nozzle, supporting pins or back-up pins should be used under the PC board. The following diagrams show some typical examples of good pick-up nozzle placement: 									
Technical considerations	<table border="1"> <thead> <tr> <th>Item</th><th>Improper method</th><th>Proper method</th></tr> </thead> <tbody> <tr> <td>Single-sided mounting</td><td></td><td></td></tr> <tr> <td>Double-sided mounting</td><td></td><td></td></tr> </tbody> </table> <p>2. As the alignment pin wears out, adjustment of the nozzle height can cause chipping or cracking of the inductors because of mechanical impact on the inductors. To avoid this, the monitoring of the width between the alignment pin in the stopped position, and maintenance, inspection and replacement of the pin should be conducted periodically.</p>	Item	Improper method	Proper method	Single-sided mounting			Double-sided mounting		
Item	Improper method	Proper method								
Single-sided mounting										
Double-sided mounting										

Precautions	<p>◆Reflow soldering</p> <ul style="list-style-type: none"> Please contact any of our offices for a reflow soldering, and refer to the recommended condition specified. The product shall be used reflow soldering only. Please do not add any stress to a product until it returns in normal temperature after reflow soldering. <p>◆Lead free soldering</p> <ul style="list-style-type: none"> When using products with lead free soldering, we request to use them after confirming adhesion, temperature of resistance to soldering heat, soldering etc sufficiently. <p>◆The conditions for Reworking with soldering irons</p> <ul style="list-style-type: none"> Put the soldering iron on the land-pattern and don't touch it to the inductor directly. Soldering iron's temperature below 350 °C, Duration 3 seconds or less.
Technical considerations	<p>◆Reflow soldering</p> <ul style="list-style-type: none"> If products are used beyond the range of the recommended conditions, heat stresses may deform the products, and consequently degrade the reliability of the products. <p>Recommended reflow condition (Pb free solder)</p>  <p>The allowable number of reflow soldering is 3 times.</p>

Precautions	<p>◆Cleaning conditions</p> <ul style="list-style-type: none"> Washing by supersonic waves shall be avoided.
Technical considerations	<p>◆Cleaning conditions</p> <ul style="list-style-type: none"> If washed by supersonic waves, the products might be broken.

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6. Resin coating and mold	
Precautions	<p>1. With some type of resins a decomposition gas or chemical reaction vapor may remain inside the resin during the hardening period or while left under normal storage conditions resulting in the deterioration of the inductor's performance.</p> <p>2. Thermal expansion and thermal shrinkage characteristics of resins may lead to the deterioration of inductors' performance.</p> <p>3. When a resin hardening temperature is higher than inductor operating temperature, the stresses generated by the excessive heat may lead to damage in inductors.</p> <p>4. In prior to use, please make the reliability evaluation with the product mounted in your application set.</p>
7. Handling	
Precautions	<p>◆ Breakaway PC boards (splitting along perforations)</p> <p>1. When splitting the PC board after mounting inductors and other components, care is required so as not to give any stresses of deflection or twisting to the board.</p> <p>2. Board separation should not be done manually, but by using the appropriate devices.</p> <p>◆ General handling precautions</p> <ul style="list-style-type: none"> • Always wear static control bands to protect against ESD. • Keep the inductors away from all magnets and magnetic objects. • Use non-magnetic tweezers when handling inductors. • Any devices used with the inductors (soldering irons, measuring instruments) should be properly grounded. • Keep bare hands and metal products (i.e., metal desk) away from inductor electrodes or conductive areas that lead to chip electrodes. • Keep inductors away from items that generate magnetic fields such as speakers or coils. <p>◆ Mechanical considerations</p> <p>Be careful not to subject the inductors to excessive mechanical shocks.</p> <p>(1) If inductors are dropped on the floor or a hard surface they should not be used.</p> <p>(2) When handling the mounted boards, be careful that the mounted components do not come in contact with or bump against other boards or components.</p>
8. Storage conditions	
Precautions	<p>◆ Storage</p> <p>To maintain the solderability of terminal electrodes and to keep the packaging material in good condition, care must be taken to control temperature and humidity in the storage area. Humidity should especially be kept as low as possible.</p> <ul style="list-style-type: none"> • Recommended conditions <p>Ambient temperature: 30°C or below Humidity: 30% to 70%</p> <p>The ambient temperature must be kept -5°C to +40°C. Even under ideal storage conditions, solderability of inductor is deteriorated as time passes, so inductors should be used within 6 months from the time of delivery.</p> <ul style="list-style-type: none"> • Inductor should be kept where no chlorine or sulfur exists in the air.
Technical considerations	<p>◆ Storage</p> <p>If the parts are stocked in a high temperature and humidity environment, problems such as reduced solderability caused by oxidation of terminal electrodes and deterioration of taping/ packaging materials may take place. For this reason, components should be used within 6 months from the time of delivery, if exceeding the above period, please check solderability before using the inductors.</p>

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